



The
Imperial Forestry Institute
University of Oxford

THIRTY-SEVENTH ANNUAL REPORT

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THIRTY-SEVENTH ANNUAL REPORT OF THE IMPERIAL FORESTRY INSTITUTE ACADEMIC YEAR, 1960-61

Introduction. As was mentioned briefly in the Report for 1959-60 Colonel A. H. Lloyd retired on 30 September 1960. He was succeeded by Mr. C. J. W. Pitt. After obtaining a science degree at Rhodes University, Grahamstown, Mr. Pitt came to Oxford as a Rhodes Scholar in 1929 to study Forestry. He obtained his degree and joined the Colonial Forest Service (as it was then called), serving in Tanganyika, the Gambia and Sierra Leone, retiring from the Service in 1954. From 1955 until he joined the Institute in 1960 Mr. Pitt was the Forestry Officer in charge of the F.A.O. Technical Assistance Amazon Project in Brazil.

Visit of the President of Finland. On 11 May, the President of Finland and Madame Kekkonen honoured the University with an official visit. After visiting Lady Margaret Hall, and taking lunch with the Vice-Chancellor at Trinity College, the President and his party proceeded to the Institute by way of the Sheldonian Theatre and Wadham College. The President had expressed a particular desire to see the Department of Forestry at Oxford, and the Professor was delighted to welcome him. Among other things shown to him was the Library, where he expressed surprise to find Finnish forestry literature, and especially the early literature, so well represented.

Building. The new top floor extension consisting of a lecture room, two laboratories and four research rooms, which was supposed to have been finished by May 1961 was not quite complete by the end of July. It is expected to be ready for occupation before the end of the Long Vacation, when it will be possible to release accommodation on the first floor for the use of the Commonwealth Forestry Bureau, which is seriously overcrowded.

Students. The number attending throughout the year was 47, as well as 3 advanced students who had been granted leave of absence. In addition, a Russell Grimwade Scholar from South Australia spent Michaelmas and Hilary Terms in the Department, and another Russell Grimwade Scholar, from Queensland, arrived for Trinity Term, and will be spending Michaelmas and Hilary Terms here.

Nine students were successful in the examination for the Forestry Honours Degree. The classes obtained were two Firsts, two Seconds, four Thirds and one Fourth. Of these, two students returned to their own countries to take up appointments, two have obtained Fellowships and are spending a year at the School of

Forestry, Yale University. One man is going into the Ministry. Unfortunately, four graduates are still seeking employment.

There were twelve students in the Third Year, three from Overseas.

The Forest Officers' Course was attended by ten Officers from H.M.O.C.S. They came from Kenya (2), Tanganyika (1), Nyasaland (1), Northern Rhodesia (1), Federation of Nigeria (1), Sierra Leone (1), Mauritius (1), British Guiana (1), Trinidad (1). Three Indian Forest Officers from Bihar, Mysore and Orissa attended the course and one Pakistani Officer from West Pakistan. One Probationer for the Malayan Forest Service and one Turkish Officer also attended.

A German student spent Trinity Term in Oxford.

Research Students. One student successfully submitted his thesis for the degree of D.Phil. His thesis was entitled 'Variation in tracheid form in the wood of conifers'. A student for the degree of B.Sc. successfully submitted his thesis entitled 'Pollen analytical studies in Northern Rhodesia' and a candidate for the degree of B.Litt. submitted a thesis entitled 'The place of hardwoods in Britain's forest economy', which has been accepted.

Two students successfully submitted theses for the Diploma in Forestry. The theses were entitled: (1) 'A study of mycorrhizal association in some trees of Western Nigeria', and (2) 'A consideration of certain mensurational methods for intensive forest management of coniferous plantations in Australia'.

Three students are working for the degree of D.Phil. and two for the degree of B.Sc.

Prizes. The Schlich Memorial Prize was awarded to R. D. H. Rowe, Assistant Conservator of Forests, Kenya. The School of Forestry Jubilee Prize was awarded to C. C. Jenkin, who was considered the most meritorious student of the year. Mr. Jenkin is planning to enter the Ministry.

Scholarships. During the year, Dr. S. E. Wilson, a consultant in wood technology, has presented the University with the gift of the copyright in his books *Decimal Hoppus Tables showing the Solid Contents of Round Timber in Hoppus Feet and Decimal Cube Calculator and Ready Reckoner* together with the present stock of copies. The income is to be used to found one or more Scholarships (to be known as the S. E. Wilson Scholarships in Forestry) to be awarded on the results of the First Public Examination to candidates intending to read for the Honour School of Forestry. The value of the scholarships is to be fixed by the Professor in the light of the needs of the scholars and the funds available after expenses of the fund have been paid, and after provision has been made for the cost of revising and reprinting the books. The first award was made this year, by the moderators of the First Public Examination, in consultation with the Professor, to R. B. Tozer. As a condition of acceptance, Mr. Tozer was re-

quired to work for a period of approximately three weeks in a sawmill, which he did at Calder's Sawmill, Brandon, Suffolk, under the supervision of Mr. J. Knight, the sawmill manager.

Both the University and the Institute are greatly indebted to Dr. Wilson for his generosity and thoughtfulness in providing this first Scholarship for Forestry students in the University of Oxford.

Instructional Tours. (1) The Introductory Tour in Britain for students starting the course for the Final Honour School and others unfamiliar with British forestry was made as usual immediately before Michaelmas Term. The tour was conducted by Mr. Edwardson, accompanied for part of the time by the Professor and Mr. C. J. W. Pitt. Utilisation visits were made to the Longhope Turnery, the Wood Distillation Plant at Speech House, Park-end Sawmill and the Pine and Plywood Factory at Lydney. State forests visited were Dean, Tintern, Coed Taf Fawr, Hay and Crumblands. Major Ackers conducted the party round the forest nursery at Huntley and the Canon Frome estate in Hereford was visited with the co-operation of Tilhill Forestry (Hereford) Ltd. and Mould & Bloomer of Grantham. We learned with great regret of the death of Major Ackers late in the autumn.

(2) *Western France.* The annual tour to Normandy and the Landes was conducted by Mr. Edwardson accompanied by Mr. Gordon. The party consisted of the Third Year students, three Indian Forest Officers, one Pakistani Forest Officer, a Liberian Forest Officer and a Turkish Forest Officer. A forester from E. Nigeria also joined the tour, and a forestry student from Zanzibar. The state forests of Lyons, Montfort, Écouves, Reno, Bellême and Mimizan were visited as well as a communal forest near Labouhère, Landes. Utilisation visits were made to the rapidly expanding hardwood pulpmill at Alizay, impregnation works at Alençon and the pulpmill and sawmill at Mimizan. It was with great regret that we learned of the death in the spring of Colonel E. Hubault who has provided, since the war, a most valuable liaison in arranging the French tours.

(3) *Eastern France and Switzerland.* The eleven Fourth Year students, together with two foresters from Sierra Leone, visited the forests in the French Jura and Switzerland during the Easter Vacation. The tour was conducted by Dr. Jones.

(4) *Postgraduate Tour in Great Britain.* Current developments in British forestry were demonstrated by Mr. Edwardson, accompanied by Mr. Gordon, to the postgraduate course at Easter, this year in south-west England. The party consisted of the postgraduate forest officers' course, the countries represented being Mauritius, Tanganyika, British Guiana, Nyasaland, Nigeria, Trinidad, Northern Rhodesia, Zanzibar, India and Pakistan. State forests visited were Dartmoor (amenity and standing sales), Wilsey Down (nutrition problems and research methods), Eggesford (management by the new W.P. code) and Cranborne Chase

(rehabilitation of scrub). We also had excellent co-operation from private estates and firms in the visits to Lord Bradford's Tavistock Woodlands (sawmill costing and group selection), Stenners of Tiverton (sawmill manufacture) and the Crichel Estate (utilisation of minor produce). Two consulting firms (Tilhill Forestry and Fountain Forestry) and a private owner (Mr. H. P. R. Hoare of Stourhead) covered very thoroughly the question of private forestry investment in relation to the tax laws and estate duty. The thanks of the Institute are due to Mr. C. A. Connell, Conservator, South-west England, and his staff; the Chief Research Officer, Forestry Commission; Mr. Crispin Gill of the Friends of Dartmoor, Lord Bradford and Mr. P. D. Hutt of Tavistock, Mr. W. P. Authers of Messrs. Stenners, Mr. A. E. Aitkins of Tilhill, Mr. J. P. Newton of Fountain Forestry, Mr. H. P. R. Hoare and Commander and Mrs. Martin and Major W. W. Seymour of Crichel Down estate for the excellent arrangements and hospitality.

(5) *Postgraduate Tour in Portugal.* In June 1961 Mr. Gordon and Mr. Pitt conducted a two-week tour of South and Central Portugal with a party of eleven forest officers from tropical countries. This was the first conducted visit to Portugal of Oxford Foresters and turned out to be a most satisfactory venture. The Institute owes thanks to the Director-General, Signor Frazao, for making the visit possible; to Signor Ferreirinha, Signor Lopes, Signor Goes and Signor Pedroso of the Portuguese Forest Service who accompanied the tour and to Donna Wiborg who acted as interpreter.

Utilization Courses. Third Year students spent two full days in the various sections of the Forest Products Research Laboratories, Princes Risborough; Forest Officers spent one full day in the more important sections and a few paid a second visit to some sections in which they were specially interested. One Forest Officer attended one of the one-week courses in Wood Technology, and later on put in another three weeks at the Laboratories. Special thanks are due to the Director and to those members of the staff who gave demonstrations and organised the visits.

Small parties of Forest Officers also visited the new sawmill and the forest machinery plant (winches and logging arches) of Messrs. Boughton at Amersham, the Road Research Establishment (Tropical section) at Hardmondsworth and the Machinery Research branch of the Forestry Commission at Alice Holt.

One Forest Officer made a special three-weeks' tour to Forestry Commission centres in East Anglia, the Forest of Dean and Scotland and visited various industrial concerns. He also made a special tour of two weeks to Sweden.

Another Forest Officer spent two and a half weeks in Germany studying the techniques and economics of chipboard manufacture.

Land Use Course. The Professor, with the assistance of Mr. J. J. MacGregor, organised a Land Use Course for Senior Forest Officers, which began immediately after the end of Trinity Term.

Thirteen officers joined the whole course, Burma (2), India (4), Malaya (1), Nigeria (2), Tanganyika (1), Fiji (1), United Kingdom (2), as well as a Member of Parliament (in his private capacity) from the United Kingdom and a Professor of Forest Economics from the U.S.A. Other people joined for the first week which consisted of lectures given by acknowledged experts in various aspects of land utilisation, and was held in Oxford. The week in Oxford was followed by a ten-day tour in Wales and the Midlands where the problems of sheep raising versus forestry, reforestation of open-cast mining areas, etc., were examined. This was followed by a tour, lasting for three weeks, visiting various land utilisation schemes in Holland, Switzerland and France. The grateful thanks of the Institute are extended to the many people both in the United Kingdom and abroad, who helped with the organisation of the tour.

Vacation Practical Work. During the summer of 1960 practical work was carried out during the Long Vacation by several students in the forests of Denmark, Norway and Sweden, through the generous assistance of the Forest Services concerned.

Excursions. During Trinity Term arrangements were made for the Forest Officers to visit the following research centres and estates: Messrs. Wm. Mallinson's Timber Yards and Veneers, London; the Forestry and Land Use Section of the Directorate of Overseas Surveys at Tolworth; Forestry Commission Research Station, Alice Holt; Timber Development Association Research Centre at Tylers Green; the Cirencester Estate, the property of Earl Bathurst, and the Forest Products Research Laboratory, Princes Risborough. The Fourth Year students joined the excursions to the Forestry Commission Research Station, Alice Holt, and the excursion to the Cirencester Estate.

The Third Year and Fourth Year students also visited the Boughton Estates of the Duke of Buccleugh and a private estate at Whitchurch, near Reading, the property of Sir Charles Rose.

The Third Year students also visited the Forestry Commission forests at Bramshill and Bernwood. Dr. Jones demonstrated.

Thanks are tendered to all who permitted students to visit their estates and factories.

Discussions. During Michaelmas and Hilary Terms, weekly discussions of forest topics of general interest, selected by the members of the Forest Officers' Course, were organised as usual. During Trinity Term, short papers on selected topics (usually the Forest Officers' 'Advanced Study') were presented by the same group, each paper being followed by discussion.

Visiting Lecturers. The usual weekly series of invited lecturers in Hilary and Trinity Terms were given. These lectures, primarily for the postgraduate class and Fourth Year students, deal mainly

with topics not fully covered by the staff of the Department. The lectures were followed by discussions.

The subjects covered were:

Developments in timber utilisation. Mr. B. Alwyn Jay, Timber Development Association.

Wood Pulp. Dr. T. H. Frankel, Sudbrook Pulp Mill Ltd.

Chipboard. Mr. L. E. Akers, Airscrew Co. & Jicwood Ltd.

Timber imports from the commercial point of view. Mr. E. H. Richardson, Messrs. Wm. Mallinson & Sons Ltd.

Arboricides. Professor G. E. Blackman, Department of Agriculture, University of Oxford.

The forest problems of Bolivia with special references to Swietenia mahogoni in the Bolivian headwaters of the Amazon. Mr. C. W. Scott, B.F.S. (retired), and until recently a Technical Adviser with F.A.O.

The application of Work Study to the Production of Pulpwood. Mr. J. Zehetmayr, Work Study Section, Forestry Commission.

Weather, plant and soil factors in hydrology. Dr. H. L. Penman, Physics Department, Rothamsted Experimental Station.

Examination and interpretation of aerial photographs. Mr. R. G. Miller, Assistant Director, Forestry and Land Use Section, Directorate of Overseas Surveys, Tolworth.

An outline of forest genetics and tree breeding. Mr. J. D. Matthews, Forest Geneticist, Forestry Commission, Alice Holt Research Station.

The application of forest genetics and tree breeding in forest practice. Mr. J. D. Matthews.

Forestry versus sheep farming. Dr. R. Phillips, Lecturer on Animal Husbandry, University College of Wales, Aberystwyth.

Forests and Industry; the concept of full integration. Mr. K. N. Rankin, The Economic Forestry Group.

Why I have not made a Working Plan. Mr. W. E. Hiley, C.B.E., formerly Chairman of Dartington Woodlands Ltd.

The aims and methods of the Nature Conservancy. Mr. E. M. Nicholson, C.B., Director-General, Nature Conservancy.

Assistance from other Departments, etc. Special courses in surveying and soil science were given to the Forestry students by Dr. A. R. Robbins of the Department of Surveying and Geodesy, and Dr. P. H. T. Beckett of the Department of Agriculture. Mr. J. Fraser Scott, Assistant to the Reader in Biometry, and Mr. G. B. Masfield, the University Lecturer in Overseas Agriculture, also gave courses to both the undergraduates and postgraduates. The thanks of the Department are extended to all lecturers concerned and the Heads of their Departments.

Assistance to other Departments and Institutions. Mr. W. A. Gordon lectured on Colonial Forestry to the Overseas Administrative Cadets at both Oxford and Cambridge, the Overseas Agricultural Service Officers at the latter University also attending. Mr. Edwardson gave a full course of lectures in Forestry in the Cambridge academic year and Mr. Gordon gave three lectures on Forestry to students of the Department of Estate Management, and, in the Easter Term, Mr. Edwardson took them on a tour of selected State Forests and private estates in the West of England and Monmouthshire.

Mr. Edwardson continued as an examiner in the Final Public Examination of the Estate Management Course at Cambridge, and as a judge of plantations for the Kent Agricultural Society competition.

He was elected to the Management Committee of the Tree Seed Association of England and Wales.

At the invitation of the Forestry Commission, Mr. Edwardson accompanied the Swedish Forestry School on their visit to the Hampden estate.

Staff Tours. As mentioned briefly last year, Professor Laurie attended the Fifth World Forestry Congress which was held in Seattle, Washington, U.S.A., in September. The Professor joined a pre-Congress tour of the three West Coast States—California, Oregon and Washington—and was able to see something of the widely varied forest types, forestry practices, and forest industries in those States. After the Congress he joined a short tour on the Southern States of Arkansas and Louisiana. He was joined at the Congress by Dr. L. Leyton, who read a paper entitled: 'Forestry and Water Supplies'. Dr. Leyton also attended the Seventh Congress of the International Soil Science Society, which was held in Madison, U.S.A., in August, where he presented a paper entitled: 'Forestry and water problems in Great Britain'.

During the Christmas Vacation Dr. Chalk visited Australia (Sydney, Canberra and Melbourne) in order to collect material for his forthcoming volume on the Anatomy of the Dicotyledons.

Scientific Societies, Committees, etc. Members of the staff have been active on the Councils and Committees of various societies, as in previous years. Professor Laurie continued as a member of the Advisory Committee on Colonial Agriculture, Forestry and Fisheries Research, and was appointed a member of the Steering Committee of the Forest Products Research Laboratory, Princes Risborough. He was also invited to join the D.S.I.R. Committee on Hydrological Research and was a member of the Council of the Empire Forestry Association and of the Society of Foresters. He served on the Committee of the Bedgebury Pinetum and on the Advisory Committee of Westonbirt Arboretum.

Editorial Committee. An Editorial Committee (Dr. Chalk, Dr. Jones and Mr. Gordon) was formed in the summer of 1960 with

the object of assisting senior students in the writing of articles for publication. The Committee started the year with a seminar attended by Forest Officers and other senior students and subsequently read all written work submitted by the postgraduate class and made recommendations for its improvement. Out of twenty articles, four, by R. D. H. Rowe, G. M. Shankariah, C. H. Murray and B. W. Greaves, were recommended for immediate publication. It was further suggested that several others could be made fit for publication by partial rewriting.

Senior Staff. The major change on the Senior Staff this year has been the appointment of Mr. C. J. W. Pitt, following the retirement of Colonel A. H. Lloyd, as already mentioned earlier. We should like to take this opportunity of welcoming Mr. Pitt to the staff of the Department of Forestry, and expressing the hope that he will spend many years working with us.

Technical Staff. At the close of the year there were fifteen technical assistants working in the eight laboratories, the Photographer's and the Artist's sections being staffed by two Senior Technicians, and the Workshops by two Senior Technicians and one Technician.

Secretarial Staff. There has been no significant change in the secretarial staff during the year.

WYTHAM WOODS

Mr. F. C. Osmaston superintended the management of the woods throughout the year. Mr. H. Probitts continued to be the Forester.

Controversy over the revised working plan and the effect of forest operations on other biological research work in the woods continued in spite of the addition of some 60 acres to the previous 'nature' reserves where no forest work is done. The whole matter has now been submitted to Council for decision on the policy of managing the Wytham Woods.

Nevertheless the main provisions of the plan were implemented during the year except for some ride improvement which was delayed for lack of funds. For the same reason purchase of much needed mechanical equipment was postponed, a postponement that itself delayed ride improvement and resulted in their progressive invasion by weed growth which made some rides hardly passable on foot.

An area of 15 acres was planted in the year, thereby completing the plantation of 49 acres of old arable land in the Pasticks. In addition about 70% of casualties that had occurred in the 1959 plantation due to the droughts of that year were replanted.

The seven men employed at the beginning of the year were reduced to five in December-January. Although this labour force is too small for the proper execution of work, the introduction of

piece-work in some cleanings and clearing operations as well as for thinning resulted in achieving the programme of cleaning plantations and thinnings. The thinnings included considerable areas which had never been previously thinned.

The very wet summer and winter intensified difficulties of extraction. From several areas no extraction of poles was possible from November to March and no heavy timber was extracted until May, while essential transport along the Singing Way to the plantations in the Pasticks was not only very difficult but cut up the ride severely. Four pipe culverts were installed but many more culverts and extensive ditching or cambering are essential in many main rides.

The main fellings of 130 trees over 12 inches quarter girth fetched a fairly good price due partly to higher market prices and partly to better quality timber. Hardwood poles from thinnings, sold for turnery, also fetched slightly higher prices. Nevertheless, owing to heavy repairs to the caterpillar tractor, to expenditure on rides, to higher wage rates, to charges for two extra men for six months and to the greater cost of piece-work, financial results were less favourable. But the piece-work, though costing more per week, cost less for work done per acre and prevented arrears of work accumulating.

The deer population has continued to increase and may now amount to 20 head. Damage in plantations is considerable. The rabbit population is also tending to increase while there has been a heavy increase in squirrels and their damage.

The woods continued to be used by students for silvicultural instruction, practical experience in road alignment, and for special subject research projects as well as for research by the staff. The gradual restoration of the woods should now progressively increase the value of the woods for these purposes.

BAGLEY WOOD

Heavy rain and labour shortage in the spring led to a reduced planting programme of five acres, over half of it on heavy clay where there was considerable damage by frost in the exceptional nights of 26 and 27 May.

Thinning has continued at a satisfactory rate and there is a heavy demand on the mill for rustic poles, stakes, sawn mining timber and general hardwood and conifer lumber.

The Forestry Commission Mensuration Branch demonstrated current permanent sample plot techniques on Bagley Plot No. 1 (*Thuya plicata*).

Compartment descriptions and enumeration of the wood, including the Woodcraft Wood addition, were prepared in the winter and spring in preparation for the Working Plan revision. One version of this plan will meet the needs of the Forestry Commission Dedication Scheme and the other will use the Forestry Commission State Forest Working Plan Code as a model.

Grey squirrels have increased greatly in numbers. A shoot was successful, but cage trapping failed.

Visitors to Bagley in the year included the Bagley Wood Committee of St. John's College, Dean Forester Training School, Cambridge University Estate Management Course, The Senior Wives Fellowship, and Mr. Kolar of the Israel Forest Service.

SILVICULTURE

Dr. E. W. Jones continued in charge of this section, with one assistant.

Teaching. Dr. Jones gave 24 lectures in silviculture to the Third Year students and 8 to the Fourth Year students. He also gave three lectures out of a course of ecology lectures given to the Third Year students by Dr. Dimbleby, Mr. Hoyle and Dr. Jones. He gave 16 lectures in ecology to the Forest Officers and the Fourth Year students. He also gave 6 introductory lectures on their forthcoming continental tours to the Third and Fourth Year students. Dr. Jones took part also in the seminars on the regeneration of tropical forests.

With Mr. Gordon and Dr. Chalk, Dr. Jones is a member of the 'Editorial Committee' for organising and assessing the written work of Forest Officers.

He gave a paper on Forestry aspects to the Land Use course held in July.

In September Dr. Jones attended the Congress of the 'Association pour l'étude taxonomique de la Flore d'Afrique tropicale' in Portugal, and thanks to the generosity of the Portuguese 'Serviço Florestais e Aquícolas' was able to see the work of the Portuguese Forest Department during a tour which lasted ten days.

He arranged a tour in Belgium, Germany and Holland for Mr. P. J. Hawkins, Russell Grimwade Scholar from Queensland who is studying the silviculture and management of irregular forests in Europe.

Research. The completion of work on the 'kurmi' of N. Nigeria, the field work of which was carried out in 1958, has been delayed by the breakdown of the Beckman flame photometer which was needed for completing some of the soil analyses. Some progress has been made in summarising the results of past records made in the Lady Park Reserve in the High Meadow Woods.

TROPICAL SILVICULTURE

The Professor gave a course of 16 lectures on Tropical Silviculture to the postgraduate and fourth year students.

A series of six seminars on various aspects of the Regeneration of Tropical Forests was held in the Michaelmas Term under the leadership of the Professor and Demonstrators.

ECOLOGY

The usual courses of lectures were given by Dr. G. W. Dimbleby, namely, Postgraduate course: General Ecology (8 lectures) and Third Year course: Temperate Forest Ecology (10 lectures).

With the assistance of Mr. P. I. Porter, Dr. Dimbleby has continued his research into the development of the soil and vegetation on certain types of land which today are available for forestry, more particularly on non-calcareous parent materials. Work this year has been largely concerned with the improvement of laboratory apparatus and practice and with increasing the scope of reference material.

Mr. R. M. Lawton (Northern Rhodesia Forest Service) spent six months in the section completing his research into the past history of some Rhodesian vegetation types. His thesis was successfully submitted for the B.Sc. degree. In the course of this work Mr. Lawton has built up a collection of pollen slides of a large number of named specimens from Northern Rhodesia. This will be held by the Forest Botany section. Such a collection has to be made in any region before pollen analysis can be undertaken. It can be combined quite easily with normal collecting procedure, and once it exists it opens up the possibility of palynological work in that region.

TREE PHYSIOLOGY AND FOREST HYDROLOGY

Dr. L. Leyton continued in charge of this section and gave courses of lectures in Forest Soils and Tree Physiology. Dr. E. R. C. Reynolds, with the assistance of Mr. B. J. Kemp and Mr. E. A. S. Ogden, concentrated on the hydrological research and Mr. M. Wilson, who replaced Miss P. J. Webb, gave valuable assistance in the nutritional investigations.

The hydrological research programme is still largely occupied with the development of techniques for quantitative studies on the various stages of the water cycle in the forest. For the measurement of incident precipitation comparisons have been made of various types of gauges mounted above the canopy; multiple regression analyses of the data indicate that much of the variability in catch can be associated with environmental variables that would be expected to affect splash, evaporation and aerodynamic efficiency. A report on these findings is being written. The stage has been reached where further experiments under more controlled conditions would appear to be desirable. In the meantime, measurements are being continued and further tests are being made of the Billwiller type of Nipher shield following initial investigations elsewhere. The results of the investigations on throughfall were presented in a paper to the British Ecological Society Symposium on Water Relations. Measurement of stem flow has since been simplified by using spirals of aluminium coach guttering and attempts are being made to improve the sampling of throughfall by

installing large conical funnels around the tree stems. The installation of electrically recording tipping buckets in conjunction with troughs has considerably reduced the labour of collecting through-fall data. Patterns of soil moisture resulting from the heterogeneous distribution of throughfall are being followed by tensiometers and nylon resistance units installed at various depths and under different regions of the tree crowns; the results for the 1961 season are awaiting analysis and it is hoped that these will aid in prescribing correct soil moisture sampling procedures. Attempts are being made to evaluate evaporation from the soil using small lysimeters filled with humus and subjected to a tension below to stimulate natural drainage conditions. Investigations continue into the application of the thermal flow technique to measure sap flux in tree stems and hence transpiration; apparatus is being constructed for continuous, automatic recording on 6 trees. Initial trials have begun on calibration in terms of actual water loss by determining the change in humidity of air pumped through a large polythene bag surrounding the crown.

In the nutritional field, investigations have been largely restricted to studying growth and nutrient uptake of *Pinus radiata* seedlings in sand cultures. After initial trials with a varying N.P.K. supply (made by Mr. W. W. G. Travers), a more comprehensive study has been begun by Mr. R. D. Burdon in which the effects of different total concentrations of the nutrient solution and of different phosphate levels are being followed using a continuous flow technique.

Dr. Leyton paid a 6-week visit to the U.S.A. in August-September 1960; he visited a number of important research stations and presented two papers, one at the International Soil Science Congress in Madison and another at the World Forestry Congress in Seattle.

SOIL MICROBIOLOGY

The course on the examination of soils in the field and lectures on soil organic matter and soil organisms were again given to the Third Year students.

Investigations have continued into the changes in the release of mineral nitrogen from soils when the reaction of the soils is rendered less acid. Acid oak mull soils released more mineral nitrogen, largely as nitrate, as the reaction becomes less acid. Material from the A₁ horizon of a *Calluna* podzol on the other hand showed comparatively little change in the production of mineral nitrogen even when the reaction approached neutrality.

Seedlings of various plant species have been grown with nitrogen in the form of N¹⁵ as almost the only source of combined nitrogen and it is hoped to use the litter from these plants and to study the release of mineral nitrogen from litter.

Mr. C. W. Love concluded his work in the Dyson Perrins Laboratory on the polyphenolic protein precipitating materials of leaves. These substances can now be obtained in a reasonably

pure state but their chemical constitution can only be partially investigated by the chemical methods at present available. It is considered that two aspects of these protein precipitating substances could now be profitably pursued. (1) A comparative study of the protein precipitating substances from the leaves of different plant species using the methods developed by Mr. Love; (2) the use of enzyme preparations for the investigation of the structure and properties of the protein precipitating substances and the complexes they form with proteins. The Forestry Commission has generously agreed to continue to support this work; Mrs. J. A. Lyne has commenced work on the first aspect and Miss S. M. Bocks will commence work on the second aspect at the beginning of October (1961). This work will be carried out in the Dyson Perrins Laboratory and the much appreciated generosity and co-operation of Professor E. R. H. Jones and Dr. B. R. Brown continues.

FOREST BOTANY

Mr. A. C. Hoyle continued as Curator of the Herbarium and Mr. F. White as Forest Botanist. At the end of October Mrs. A. F. Dyer, after seven years of capable and industrious service, resigned her post as Herbarium Assistant and was temporarily replaced by Mr. G. T. Prance. Otherwise the herbarium staff remained unchanged.

In September Mr. White represented the herbarium at the fourth plenary congress of the Association pour l'Étude Taxonomique de la Flore d'Afrique tropicale (A.E.T.F.A.T.) and read a paper on 'The history of plant collecting in Northern Rhodesia'. After the meeting he spent three weeks studying *Ebenaceae* in the herbaria in Portugal, Paris and Brussels.

Teaching. The courses in Systematic Botany and Regional Systematic Botany were given by Mr. White; that on the Ecology of Dry Tropical Woodlands by Mr. Hoyle. A study of exotic tree species in Zanzibar Protectorate by Mr. J. U. Dahoma was supervised by Mr. White.

Research. (1) At the end of the academic year the printers had almost finished printing the *Forest Flora of Northern Rhodesia*. (2) Dr. Styles made considerable progress in his monographic work on the *Meliaceae*. The account of the family for the *Flora Zambesiaca* is nearly finished. (3) Mr. White continued to work on African *Ebenaceae* and sent two papers to press. (4) Mr. Prance worked part-time on a doctoral thesis on generic limits in the *Chrysobalanoideae*. At the end of the year he was awarded a N.A.T.O. studentship and will spend the next two years working full-time on his research project. (5) The large collection made in Northern Rhodesia by Mr. White last year has been mounted. Names for the grasses and many of the herbs have been received

from the Government Herbarium, Salisbury. Work on the remainder is progressing satisfactorily at Kew. (6) Mr. Hoyle continued writing the results of his work on *Brachystegia*; a detailed study of the few available collections of bark has revealed a fairly good correlation between bark-development and the groups established on other characters. Basic illustrations of all the species and of some complexes were completed by Mrs. Dyer before she left.

Forest Herbarium. During the year 2,932 specimens were received. Of the 1,707 specimens received for identification, the largest collection (757) came from Brunei and is correlated with wood specimens sent to Princes Risborough for testing. From Northern Rhodesia 382 specimens were received, and 520 from Nigeria. Other herbaria, principally those at Brussels, Kew, Paris, Pretoria, Salisbury and Wageningen presented 1,225 specimens. Identifications (420) were sent to—Northern Rhodesia (336), Nyasaland (61) and Nigeria (23) and 3,150 duplicates were distributed to other herbaria. Mrs. E. M. Woodley supervised the mounting of 4,123 specimens (1,239 more than last year), and efficiently attended to much of the routine herbarium work.

Visitors and Enquiries. Visitors, other than staff members and students, as in previous years, continued to make use of the herbarium and consult the staff.

FOREST PATHOLOGY

Mr. W. R. Day remained in charge of the section assisted by Mr. D. K. Barrett and Miss J. S. Palmer. The usual courses of instruction were given to the Honour School and a course in Forest Hygiene to the Postgraduate students. As usual various demonstrations dealing with problems in forest pathology and hygiene were given.

The dying of bark on main stems of Japanese larch, Sitka and Norway spruces, and Douglas fir. Much time was spent during the year in collecting for publication the results of work over a number of years on the general problem of the dying of bark on main stems of conifers in plantations in high canopy and planted since the First World War. Complex problems are here involved which are not yet fully elucidated but the evidence so far is that for all the species of tree investigated death of bark results directly from the action of a physical factor during the first part of the growing season when the formation of early wood is in progress. There is evidence that failure to maintain the moisture content of tissues locally on the main stem is basically important and that the development of this condition is made possible by the condition of the root system as determined by the environment available for root development and action. There has been no evidence so far that infections or infestations have had basic importance.

Considerable time was spent investigating the distribution of bark necrosis in Douglas fir (*Pseudotsuga taxifolia*) in relation to variation within this species. Investigation of trees of known strain showed that if cross-sectional dimensions of mature leaves from a well-lit shoot in the upper crown are taken, there is a significant regression throughout the species of depth in relation to breadth of needle. The most critical dimension is depth: the Coastal type (*viridis*) has characteristically the narrower and thinner needle; the Interior Dry Belt or Fraser River type (*caesia*), typically has much thicker and rather broader needles; while the Rocky Mountain type (*glauca*) is typically characterised by the thickest and broadest needles.

Present experience indicates that in the south-east of England (e.g. in Hemsted Forest) *viridis* is as susceptible to bark necrosis as any other aspect of the species, particularly on the poorer soils. In the Midlands and South-West, however, *viridis* has been virtually or quite unaffected even on sites where *caesia* has been seriously diseased. No example of this type of disease has been observed in Wales, the North of England or in Scotland, though it is quite certain that strains occur there which are susceptible in parts of England. The variety *glauca* has been insufficiently planted for effective observations to be made.

Decay and stain in Norway spruce in Lake Vyrnwy Forest. More isolations made from freshly felled trees have shown that at least three basidiomycetes occur in affected wood; one of these is *Stereum sanguinolentum*; the identity of the other two is not yet known. Preliminary investigations have shown that interesting relationships of antagonism occur between different mycelia isolated from this wood suggesting the possibility of complex relations in regard to successional occupation of the substratum. The affected stands are to be felled and it is unlikely that much more field work on this problem will be possible.

Dying back of Corsican Pine. The work done on this subject during recent years will be published next year. The general conclusion is that Corsican pine in this country is subject to dying back of shoots partly because of injury by low temperatures at the beginning of the growing season and partly because of site supply deficiencies: these deficiencies have not been analysed but it is certain that deficiency of water is important, though under some circumstances nutrient deficiencies may be also. Other factors may play an appreciable and primary part, e.g. infestation by Pine Shoot beetles: infections appear to have secondary importance. Low temperature injury occurs most severely up to and during the thicket stage in plantation development; supply deficiency appears to act most severely after this. The catastrophic dying of trees is largely to be explained by prevention of development of new leaves through the continued killing of shoots which is characteristic of severe injury during the thicket stage: it is in connection with this that Pine Shoot beetle infestation may be important.

Towards the end of the year various strains of Black pine, including Corsican strains, were tested in a refrigerator for susceptibility to injury by low temperature at the request of Mr. M. V. Edwards, Silviculturist (North), Forestry Commission. The species *Pinus nigra* as represented by the strains available, was found to be appreciably variable in susceptibility to such injury and some of the more susceptible provenances were of Corsican origin. The testing was carried out just as spring expansion of buds had begun and it was interesting that the types of injury which occurred to buds and shoots were the same as those commonly to be found in affected plantations in early May. This may be taken as experimental demonstration of one aspect of shoot dying back on Corsican pine.

Pythia associated with root disease. During the year evidence was obtained that indicated the importance of soil conditions in determining the severity of development of infection. One is here concerned with conditions that determine the length of life and vigour of development of smaller roots. Field observations suggest the importance of understanding these; but it seems to be quite plain that the matter is complex and involves physical and chemical as well as biotic factors.

Crown debility, susceptibility to wind-throw and root-disease. In even-aged plantations of conifers after an age of about twenty-five to thirty years a loss of foliage density may set in, usually irregularly in the general canopy, or there may be a period of susceptibility to wind-throw. The plantations under observation recently have been of Douglas fir visited in connection with the work on bark necrosis. This species is susceptible to wind-throw on a wide variety of soils, though not necessarily to a serious degree. The examination of root-plates turned over has always revealed evidence that some dying back of the root system took place before overthrow and sometimes it is obvious that one of the principal factors determining susceptibility to wind-throw is to be found here. Wind-throw in plantations in which the canopy shows undue loss in foliage density has always revealed an appreciable dying back of root-systems and it is reasonable to associate loss of canopy condition with loss of condition in the root system: excavations of root systems in affected plantations has always shown similar evidence that infections play a part: possibly leaf condition, as dying back of roots but sometimes it is obvious that non-parasitic factors are important; equally there seems sometimes to be evidence that infections play a part: possibly leaf condition, as determined for example by infestation with *Adelges cooleyi*, may be important. These conditions do not usually result in death of trees, unless blown over, but may have considerable importance in determining stand density and canopy condition. Some preliminary observations in progress may suggest other lines of investigation.

It is desired once more to acknowledge the interest shown and help given in the work by Mr. Barrett and Miss Palmer. Miss

Palmer will leave to be married shortly in the ensuing year and it is desired particularly to acknowledge the very helpful term of service she has given in this section.

FOREST ENTOMOLOGY

Mr. G. H. Thompson continued in charge of this section with Mr. E. R. Skinner as assistant. The usual undergraduate courses were given in Forest Zoology and Animal Ecology. Four undergraduates undertook entomological special subjects.

The manuscript of an insect/host-tree list of Ghanian Forest Coleoptera was completed.

Research. (1) The eighth annual assessment was made of ash and sycamore billets laid down in 1953 in Wytham Wood for the study of insect succession; 4 billets of each species were analysed.

Approximately 56% and 18% of the bark, in all cases very loose, remained on the ash and sycamore respectively. The underbark fauna again consisted mainly of collembola, molluscs, woodlice and worms. The wood of both species showed advanced decay, particularly in the case of sycamore. Elaterid, pyrochroid and tipulid larvae were present in the wood of ash and pyrochroid and tipulid larvae in sycamore.

(2) *The influence of some factors on the emergence of the Alder Woodwasp (Xiphydria camelus L.).* S. N. U. Fernando investigated the effect of temperature, gravity, place of oviposition and texture of the wood on the point of emergence of the adult woodwasps. The distribution of emergence holes was found to depend solely on temperature.

(3) *Some aspects of the inter-relationship between woodwasps and fungi.* T. Fawcett studied larvae of *Sirex gigas* L. in larch and *Xiphydria camelus* L. in alder and their associated fungi. The absence of a hypoleural organ in the larva of *Xiphydria* was confirmed and there was some evidence that the fungus *Daldinia concentrica* in alder can proliferate in drier wood than can *Stereum sanguinolentum* in larch, which might explain why the larva of *Xiphydria* is not obliged to transport fungus into the pupal chamber.

(4) *Insect succession in decaying alder (Alnus glutinosa (L.) Gaertl.).* B. D. Slymon demonstrated that the succession of wood-boring insects found in dead alder shows close correlation with the decrease in density of the wood as decay progresses; moisture content (expressed as a percentage of the saturated weight) acts as a modifying factor.

(5) *Insect succession in decaying ash.* T. M. Adnan made a preliminary study of insect succession in ash based on annual samples from billets 1-8 years after felling.

(6) *Cinematography of living insects.* Ciné records are valuable both for research and teaching and during the year Messrs. G. H. Thompson and E. R. Skinner carried out research on the technical problems associated with cinematography of living insects: the main requirements are lack of vibration and a high intensity of illumination at a fairly low temperature.

Miscellaneous. Mr. G. H. Thompson was appointed in April to represent the University of Oxford on the British Universities Film Council; he was elected to the Executive Committee at the annual general meeting in May.

A 26 min. 16 mm. ciné film in colour entitled 'The Alder Woodwasp and its insect enemies' was completed in October. The film won the major and minor prizes in the 1960 Natural History Film Competition organised by the B.B.C. and Council for Nature. The film was shown on the B.B.C. TV 'Look' programme on 19 May when Mr. Thompson appeared with Peter Scott and gave the commentary. The film was chosen as one of the British entries for the 15th International Scientific Film Association Congress in Rabat, Morocco, in September 1961. It was also selected for showing at the Edinburgh Festival and British Association for the Advancement of Science meetings in the same month. The British Council included the film in their programme of a dozen films shown at a festival held in Turin in July and it was also shown at a meeting of the Research Film Section of I.S.F.A. held at Göttingen in May. The film was chosen for showing at the annual general meetings of the British Universities Film Council, the Council for Nature and the Scientific Film Association, and it was used to illustrate talks on the Alder Woodwasp and its parasites to many bodies during the year, viz. Zoology Department at Oxford; O.U. Entomological Society; XII Congress of the Society for British Entomology; Forestry Commission; Zoology Department, Cambridge; British Museum, Royal Entomological Society; Forest Products Research Laboratory, Princes Risborough.

MANAGEMENT

Mr. F. C. Osmaston remained in charge of the management section in which there was no major change.

The first course for Third Year undergraduates included 24 lectures in Hilary and Trinity Terms, a tour (which also included Silviculture) in Normandy and the Landes in March and five weeks practical work in the New Forest in September. The second course for Fourth Year undergraduates included 16 lectures in Michaelmas and Hilary Terms, two weeks practical work in the New Forest in March and a tour in the Voges and Switzerland.

The main course of lectures given by Mr. Osmaston was supplemented by Mr. T. E. Edwardson and Mr. W. A. Gordon who gave some lectures on aspects of management particularly applicable to Britain and tropical Commonwealth countries, respectively.

The practical work in the New Forest consisted in the preparation of a full working plan by each student for an area of 540 acres. The area provided considerable variation in both site conditions and growing stock. Problems to be solved included choice of species, conversion or retention of hardwood high forest, choice of rotation and attainment of sustained yields as well as satisfaction of amenity demands. The practical work was in two parts. In September, the basic data were collected. Each student then individually wrote Part I of his plan and submitted it for criticism which he was permitted to embody in his Final Part I. Objects of management were given to the students in March so that on their second visit to the New Forest each could finish his plan with full prescriptions in Part II, being able to check in the field both the previous field work and the application of the prescriptions.

Mr. Osmaston also gave to Fourth Year undergraduates in Michaelmas and Hilary Terms a course of 14 lectures on Silvicultural Systems, and to postgraduate forest officers 2 lectures on special points in management. He also took part in Seminars on the regeneration of tropical forests and other Discussion Groups.

Supervision and assistance were also given to postgraduate students, particularly those from Turkey, India and the East.

Mr. Osmaston was Chairman of the Examiners for the Final Honour School of Forestry. He was appointed a member of the Regional Advisory Committee (E. England).

MENSURATION

Teaching. The customary course of lectures and practical classes in mensuration was given to both Third and Fourth year undergraduates by Mr. Edwardson, who also gave a series of lectures as part of a postgraduate course on selected points in mensuration and management, with emphasis on the use of the electronic computer. Volume table (or similar regression problems) and forest inventory assessments are now very thoroughly covered by programmes written for the section by Mr. J. F. Scott and the O.U. Computing Laboratory. Programmes for analysing experimental lay-out (starting with Randomised Blocks) are the next phase of development.

Field data collected on the New Forest Working Plan exercise were as last year sent by post to Oxford for computer analysis. Mr. J. F. Scott attended the inventory part of the plan exercise, after an 8 weeks advisory visit to the Federal Research Station, Nigeria.

Research. The year has been largely occupied with the organisation of computer work to deal with a steady increase in data being sent in from overseas for analysis. A complex Nigerian Research Branch experiment was done with the co-operation of the Forestry Commission statistician at Alice Holt, using 'Pegasus'. Analysis of a regeneration count survey was done for Western Nigeria.

Volume tables supported by 11,000 measurements were prepared for the Malayan Forest Research Department and this will be written up for publication. Volume tables were also computed for the Forest Departments of Sierra Leone and Nyasaland. (At the time of reporting this work is building up rapidly.)

An investigation, using the computer, of Dean oak and Chiltern beech data suggested that a local volume table would be cheaper for a given precision than a general table. Surprisingly, in the Chiltern beech it was found that the multiple regressions for three or four woods on the Hampden Estate were significantly different so that the attempt to produce a general volume table for Chiltern beech will require further study and data.

Mr. J. McM. Christie of the Forestry Commission demonstrated to the Fourth Year and some forest officers, current sample plot techniques (plot Bagley No. 1. *Thuya plicata*).

J. W. Bride (Northern Nigeria) had a report published of his computer investigation of volume table data. A diploma study by A. Keeves, South Australia, on a thinning topic, was supervised, as also was an advanced study by N. R. Brouard, Mauritius, on a mensuration research programme for the island, and a special subject investigation by H. L. Wright of assortment table construction with computer help. An advanced study on increment determination by C. A. John of British Guiana was also supervised by Mr. Edwardson.

A discussion was held with the Statistician, Alice Holt, J. F. Scott and a group of forest officers on the subjects of clinal plots and 'Correlated Curve Trend' plots, and the outcome will be published.

The patient computer work by Mrs. Allington and Miss O'Mahoney are gratefully acknowledged.

British Forestry Advisory Work. Mr. Edwardson advised the Technical College, Oxford, the Agricultural Research Institute, Begbroke Hill, Headington School, the authors of a caravan camp project in Norfolk and Oxford Architect's Department on ornamental and shelter tree planting.

A forestry lecture was given to Shutford Women's Institute and students were given useful practical work on a hedgerow valuation carried out by Mr. Edwardson on a 3,000 acre Norfolk estate.

Mr. Edwardson attended the annual conference of the Economic Forestry Group.

Advice on dangerous elms and the killing of stumps with 2, 4, 5-T was given to local people.

AERIAL SURVEY

The course of eight lectures on photogrammetry and interpretation of aerial photographs was given by Dr. A. R. Robbins and Mr. F. C. Osmaston to postgraduate students in Michaelmas Term. Each lecture was followed by two hours' practical work. Some Fourth Year students also attended the class.

In addition Mr. R. G. Miller, Assistant Director, Forest and Land Use Section, Directorate of Overseas Surveys, Tolworth, gave a special lecture in Trinity Term on the use of aerial photographs in Forestry. This lecture was succeeded by a visit to the Directorate of Overseas Surveys where the whole process of map-making from aerial photographs was seen.

STATISTICS

By arrangement with the Reader in Biometry, Mr. J. Fraser Scott gave a course of lectures on elementary statistics for Forestry students.

WOOD ANATOMY

Dr. L. Chalk continued in charge of the section with Mr. A. A. Shaw and Mr. P. G. H. Franklin as his assistants. The usual undergraduate and postgraduate courses were given. Three undergraduates and one forest officer carried out research for special subjects and advanced studies respectively and there were one D.Phil. and two B.Sc. students.

Research.

(1) Tracheid length in *Pinus caribaea* Morelet. C. H. Murray continued the investigation initiated by S. H. Inchbold-Stevens and continued by J. M. Bayne in 1959. Work on two more trees from British Honduras confirmed the pattern of variation found by Inchbold-Stevens. Investigation of these trees grown in Trinidad from British Honduras seed provided a very interesting comparison with the material grown much more slowly in natural forest in British Honduras. In both sets of material the curves of tracheid length from the pith outwards flattened out to a more or less stable length at the same distance from the pith (about 8 cm.) in all the trees, though the fast-grown Trinidad trees were only 12 years old compared with 30-100 years for the British Honduras trees. The stable length achieved was, however, much lower in the fast-grown plantation trees and this was attributed to the development of 'mother cells' in the very wide rings.

(2) Periodic growth in *Triplochiton scleroxylon* K. Schum. From a series of borings taken throughout the year R. G. Lowe deduced that cambial activity reached a peak during the rainy season and became sluggish during the dry season. During two months at the end of the dry season, xylem differentiation ceased.

The growth rings, which appeared to be annual, were made conspicuous in sapwood by iodine, which revealed the pattern of starch deposition in the parenchyma: starch was relatively scarce in the early wood and abundant in the late wood.

Two kinds of parenchyma were observed, the usual 2-4 celled strands which contained abundant starch, and fusiform parenchyma strands, which contained no starch. The short uniseriate tangential rows typical of this species tended to be wholly of one type or the other.

(3) Evidence from wood anatomy on whether *Ptaeroxylon* and *Vavaea* are correctly placed in the Meliaceae.

Mr. C. C. Jenkin concluded that *Ptaeroxylon* would be better included in the Rutaceae, sub-family Toddalioidae, but that there is not sufficient evidence from the wood anatomy alone to justify removing *Vavaea* from the Meliaceae, though, if indicated by other lines of study, this genus might be placed in the Sapindaceae, near the genus *Exothea*.

The Wood Collection

The most important addition was 570 Brazilian woods from the Krukoff collection, obtained on an exchange basis from the Smithsonian Institution, Washington, for the duplicate collection of Sarawak woods made by Mr. G. H. Pickles and purchased from the Oxford University 1955 Borneo Expedition. Other valuable acquisitions were 157 specimens from the Forest Faculty, Zagreb, Yugoslavia, 125 specimens from the Forest Department, Northern Rhodesia, *per* Mr. H. P. Mostyn, and 84 specimens from the Forest Department, Ceylon, *per* Mr. M. Namasivayam. Specimens were also received from the Forest Departments of Nigeria and Tanganyika and from Professor F. R. Milanez of the Botanic Gardens, Rio de Janeiro.

FOREST ECONOMICS

This section was under the charge of Mr. J. J. MacGregor; Mr. F. E. Balman has been mainly engaged on the reports of the Economic Survey of Private Forestry. Mr. R. Lorrain-Smith was appointed in January 1961 as full-time assistant on the Survey on which Mrs. A. Gurden has been mainly concerned with the statistical and other analyses. Miss J. M. Johnson has been responsible for the secretarial work, preparation of reports, and assisted in the preparatory work for the 1961 Land Use Course.

Teaching

Lectures and tuition in Economic Theory and Forest Economics were given to final year and other students. Seminars and study groups for forest officers were also arranged. The Forest Economist supervised the 'advanced study' of Mr. R. D. H. Rowe on *Economic Possibilities of Producing Particle Board in East Africa. An Interim Report*.

Research

The main research has been on the economics of private forestry in England and Wales. In earlier years the emphasis was on costs but now that an increased annual grant has been received from the Forestry Commission the main concern will be to assess the general economy and net income of private forestry. A Working Party was formed by the Forestry Commission to discuss the most useful way in which the Survey (undertaken by Aberdeen and Oxford Universities) could best be conducted.

A survey report was prepared reviewing the significance of some results of work carried out in the section over the previous 15 years.

Committees

The Forest Economist has continued to serve as a co-opted member of the Economic Sub-Committee of the Timber Growers' Organisation, as a member of the Oxon and Bucks. Committee of the Royal Forestry Society of England and Wales, and is a Council member of the Society of Foresters of Great Britain. With Mr. Balman he was also a member of the Working Party on Private Forestry Receipts organised by the Forestry Commission. During the year he has worked on behalf of the FAO/ECE Study Group on a Multilingual Glossary of Forest Work Science and, as a member of the I.U.F.R.O. Section 31 Working Party on Productivity, he attended a meeting in Norway to draft a report for the conference held in Vienna in September 1961. During the year the Forest Economist was reappointed to the Natural Resources (Technical) Committee's Land Use Study Group at the Ministry for Science.

General

For the 1961 Land Use Course for Forestry and Agriculture pioneered by the I.F.I. in 1959, the forest economist was involved in the preparation of the programme and in helping Professor Laurie to conduct the course.

FOREST LAW, TAXATION AND ADMINISTRATION

British Forest Law. Mr. Gordon gave a course of 20 lectures on British Forest Law, Land Tenure and Taxation to a class of Fourth Year students. Two took the subject in the Final Honour School of Forestry.

Colonial Forest Administration. Mr. Gordon gave a course of 12 lectures to a class of Final Year students and Forest Officers. Four candidates took this as an additional subject in the Final Honour School of Forestry.

In addition, Mr. Gordon gave three lectures on Forest Management to the Fourth Year students and the Forest Officers, and two lectures on the legal aspects of Forest Protection to the Third Year students. He also conducted two seminars for the Forest Officers on the Law of Evidence and Contract, and one seminar on Selected Points in Forest Management for the Forest Officers. Mr. Gordon assisted at all the Forest Officers' seminars and discussions.

FOREST POLICY, FORESTRY AND LAND USE

The Professor gave a course (16 lectures) on Forestry and Land Use to the Third Year students in the Michaelmas Term, and a course of 12 lectures on Forest Policy in the Trinity Term to the Fourth Year students.

FOREST UTILISATION AND ENGINEERING

Twenty-four lectures in Forest Utilisation and fifteen in Engineering were given by Mr. J. Pitt. The usual road project was carried out by Third Year students on the Wytham Estate and also a small bridge project over the Cherwell. Practical work was done in the summer by several students in Sweden and Norway.

A practical course in the Institute Workshop on the maintenance and sharpening of saws was attended by the Forest Officers, a similar course was introduced for the Third Year students. Most Forest Officers also attended a course over eight evenings on car maintenance at the City of Oxford Technical College. Two Forest Officers visited Stenner's sawmill factory at Tiverton and Gordon's fibreboard factory at Queensferry. All Forest Officers visited the Timber Development Association research station at Tyler's Green and Mallinson's timber yards and Veneer Exhibition in London.

Some utilisation films were shown in the joint lecture theatre.

Mr. Pitt replaced Col. A. H. Lloyd on the Council of the British Wood Preserving Association and attended the annual convention at Cambridge in July. He also attended a course given by the Timber Development Association at King's College, Newcastle.

PROTECTION

The course of lectures (five) on Fire Protection and Counter Erosion, to which Shelterbelts was added, was given by Mr. Pitt. The legal side of Protection was dealt with by Mr. W. A. Gordon and the economic aspects by Mr. J. J. MacGregor.

SURVEYING

The usual course in Surveying was given in the Trinity Term by Dr. A. R. Robbins of the Department of Surveying to the Third Year students.

LIBRARY

The reorganisation of the contents of the Library was completed during the summer vacation. This is the final major move that can be made with the space available. With this problem in mind, the Professor and the Library Committee gave serious consideration to the future of the Library.

It was decided to investigate the possibility of microfilming. To study techniques and cost, the Librarian and Mr. H. F. Woodward visited Recordak studios in London, and consulted Mr. Verry of O. & M. Department, H.M. Treasury. A report was submitted to the Library Committee, and the Professor agreed to investigate the possibility of obtaining financial help to enable the Department to set up a microfilming unit.

Mrs. D. R. Cloke continued her revision of the 'List of Periodicals' and completed the major part of the revision early in the new year. It is hoped to distribute the list by the autumn of 1961.

The increase in map holdings necessitated the purchase of a metal cabinet. The wooden map cabinets which had not proved

satisfactory are being modified by the workshop staff. New strip mountings are being fixed to every map.

The new year began badly for the Library. Two members of the staff resigned in rapid succession. Mrs. D. R. Cloke, M.A., Assistant Librarian since November 1954 left at the end of January, followed three weeks later by Miss C. Littler, Library Clerk. Miss A. B. Collins, B.A., formerly Secretary to the Director of the Commonwealth Forestry Bureau, was appointed in Mrs. Cloke's place, and Miss L. Clinkard replaced Miss Littler. Miss P. Beyer, sole survivor of the original team, continued to give excellent service, being particularly helpful during the change-over period.

Mr. R. Semple worked in the Library for 10 days before he became Librarian of the Forestry Commission Research Station at Alice Holt.

Mr. Elfric Porte, Librarian, College of Forestry, University of Liberia, arrived in February to work for nearly a year in the Library and in the Commonwealth Forestry Bureau.

In September the Librarian was invited to visit the Library of the Faculty of Forestry at Istanbul University. The purpose of the visit was to classify books by the Oxford Decimal Classification, and to advise on the setting up of a new central library. He left on 31 July to spend some weeks in Turkey.

The Library was honoured in May by a visit from the President of Finland. A special exhibition demonstrating the Library's long association with Finnish Forestry organisations was arranged.

Five new wooden cabinets were added to the main catalogue, which was re-spaced. A new wooden cabinet was made for the book catalogue.

The Library Committee met on 12 occasions. At the request of the British Museum each copy of the 'Library Bulletin' will be preserved there in accordance with the Copyright agreement.

The Stock-copy collection was increased by 136 (149) items.

Translations were increased by 109 (64).

New periodicals received 5 (3).

New series, incl. Annual Reports 54 (55).

Costs. During the year the Library expenses amounted to £4,069 (£3,889) of which £3,191 (£2,947) were on staff salaries, and the balance on books, periodicals, binding and equipment.

Visitors. Dr. Webb (U.S.A.), Mr. Dienemann (Nigeria); Dr. Heikinheimo (Finland), Mr. Loynes (Wiggins Teape), Mr. Smythies (Barnet House), Mr. Sampaio (Portugal), Mr. Baur (New South Wales), Mr. Chimbault (Nogent sur Seine), Mr. Davidge (Kew), Mr. Nisbett (Canada), Miss Welch (Cambridge), Mr. Armistage (S. Rhodesia), Mr. Kerfoot (Kenya), Professor Hellinga and Professor Kools (Netherlands), Professor Vaux (California), Mr. Kulkarin (India), Professor Beasley (Canada), Mr. Plumb (Kenya).

Gifts. The Librarian acknowledges with gratitude the many valuable gifts which the Library continues to receive from individuals and organisations.

ACCESSIONS

Issues of periodicals	2132 (1932)
Current annual reports	257 (213)
Books	127 (160)
Maps	60 (86)
Miscellaneous (pamphlets, etc.) ...	2719 (2516)
	<hr/>
	5295 (4907)

LOANS

	Staff	Bureau	Students	Visitors
Periodicals				
circulation ...	2828 (2696)	—	—	—
direct ...	234 (351)	175 (181)	237 (231)	482 (420)
Books ...	223 (209)	66 (74)	824 (782)	109 (70)
Miscellaneous	610 (508)	148 (338)	553 (650)	361 (382)
	<hr/>	<hr/>	<hr/>	<hr/>
	3895 (3764)	389 (593)	1614 (1663)	952 (872)
Total Loans=6850 (6892)				

CATALOGUE CARDS

Subject (Oxford) cards	17978 (18006)
Author (Oxford) cards	8672 (8479)
(Flury) cards	287 (77)
	<hr/>
	26937 (26562)

The total number of cards in the catalogues is now 463237

PHOTOGRAPHIC SECTION

During the year the following major items were dealt with by the Photographer, Mr. H. F. Woodward:

Prints and enlargements	3349 (2902)
Photo copies	1241 (nil)
Dyeline prints	267 (nil)
Photographs and photomicrographs taken	357 (317)
Negatives processed	1105 (472)
Lantern slides	44 (44)

A special job undertaken was the production of thirty measurement overlay transparencies. The second stereoscopic album of Wytham Aerial Survey photographs was completed.

In addition, the usual routine tasks of mounting, heat sealing, projector maintenance, photograph collection maintenance, etc., were continued.

The installation of the A. B. Dick photocopy machine has enabled the section to provide an immediate copy service to the Library and others and also makes it possible to turn out dyeline working plan maps, etc., up to 10 x 16 inches in size.

APPENDIX I

PUBLICATIONS

SILVICULTURE

Original Publications

- British Forestry in 1790-1813, by E. W. Jones. *Quarterly Journal of Forestry*, 55: 131-8.
- Application of Silvicultural Methods to some of the Forests of the Amazon, by C. J. W. Pitt. F.A.O. Report to Brazil, No. 1337. Rome 1961.

Reviews

- The Afforestation of Upland Healths, by J. W. L. Zehetmayr. Forestry Commission Bulletin No. 32. *Quarterly Journal of Forestry*, 55: 186-8. (E. W. Jones.)
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APPENDIX II

I. STAFF ENGAGED IN INSTRUCTION AND RESEARCH

- PROFESSOR M. V. LAURIE, O.B.E., M.A. (Oxon), M.A. (Cantab).
Tropical Forestry, Forestry and Land Use, Forest Policy.
- L. CHALK, M.A., D.Phil. (Oxon). Wood Structure and Properties.
- W. R. DAY, B.Sc., M.A. (Oxon). Pathology, Forest Hygiene.
- C. J. W. PITT, M.A. (Oxon), B.Sc. (Grahamstown). Forest Engineering and Utilisation.
- E. W. JONES, M.A. (Oxon), Ph.D. (Cantab). Silviculture.
- G. H. THOMPSON, B.Sc., M.A. (Oxon). Forest Zoology, Entomology.
- T. E. EDWARDSON, B.Sc., M.A. (Oxon), B.Sc. (For.) (Edinburgh). Mensuration, British Forestry.
- W. A. GORDON, M.A., Dip. Anth. (Oxon), Bar. at Law (Lond.). Colonial Forestry, Forest Law.
- F. C. OSMASTON, M.A. (Oxon). Forest Management, Aerial Survey, Silvicultural Systems.
- J. J. MACGREGOR, B.Sc. (Glasgow), M.S. (Wisc.), B.Litt., M.A. (Oxon). Forest Economics.
- W. R. C. HANDLEY, M.A. (Oxon), Ph.D. (Leeds). Microbiology.
- L. LEYTON, M.A. (Oxon), Ph.D. (Leeds). Tree Physiology.
- G. W. DIMBLEBY, B.Sc., M.A., D.Phil. (Oxon). Forest Ecology.
- A. C. HOYLE, B.Sc., M.A. (Oxon). Forest Botany and Ecology.
- F. WHITE, M.A. (Oxon), M.A. (Cantab). Forest Botany.
- E. R. C. REYNOLDS, B.Sc., Ph.D. (Lond.), D.I.C., A.R.C.S. Forest Hydrology.
- B. T. STYLES, M.A., D.Phil. (Oxon). Forest Botany.

II. STAFF OF OTHER UNIVERSITY DEPARTMENTS ASSISTING IN INSTRUCTIONAL WORK

- P. H. T. BECKETT, M.A., D.Phil. (Oxon). Soil Science.
- A. R. ROBBINS, B.Sc., M.A., D.Phil. (Oxon). Surveying and Aerial Survey.
- J. FRASER SCOTT, M.A. (Oxon). Statistical Methods.

III. OTHER STAFF

Secretary: Miss H. M. EDWARDS

Assistant Secretary: Miss I. BLAGROVE

Librarian: Mr. E. F. HEMMINGS

Assistant Librarians:

Mrs. M. CLOKE, M.A. (Oxon), until January 1961

Miss A. B. COLLINS, M.A. (Lond.), from January 1961

OXFORD FORESTRY MEMOIRS

Nos. 1-4, 10-12, 14-16, 18, 20-22 are out of print.

5. *The Physiography of Southern Nigeria and its Effect on the Forest Flora of the Country*, by J. R. Ainslie. 1926. 4s.
6. *The Financial Return from the Cultivation of Scots and Corsican Pines*, by W. E. Hiley. 1926. 3s. 6d.
7. *The Gold Coast Forest: A Study in Synecology*, by T. F. Chipp. 1927. 10s.
8. *The Forest Industry of Finland*, by W. E. Hiley. 1928. 4s. 6d.
9. *Aerial Survey in Relation to the Economic Development of New Countries, with special reference to an Investigation carried out in Northern Rhodesia*, by R. Bourne. 1928. 7s. 6d.
13. *Regional Survey and its relation to Stocktaking of the Agricultural and Forest Resources of the British Empire*, by R. Bourne. 1931. 15s.
17. *The Physiography and Vegetation of Trinidad and Tobago; A Study in Plant Ecology*, by R. C. Marshall. 1934. 6s.
19. *The Use and Misuse of Land*, by R. MacLagan Gorrie. 1935. 6s.
23. *The Development of British Heathlands and their Soils*, by G. W. Dimbleby. 1962. £3. (Available only from Clarendon Press, Oxford.)

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Nos. 2-14, 20 and 23 are out of print.

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15. *Vegetation Types of the Colonie du Niger*, by J. Dundas. 1938. 3s. 6d.
16. *A Forestry Tour in 1937*, by L. Chalk. 1939. 2s. 6d.
17. *The Influence of Vegetation on Climate in West Africa, with particular reference to the protective aspects of Forestry in the Gold Coast*, by H. W. Moor. 1939. 1s.
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24. *An Introduction to the Forests of Central and Southern Ethiopia*, by W. E. M. Logan. 1946. 4s.
25. *The Forest Economy of three Private Estates in Great Britain*, by J. J. MacGregor. 1949. 7s. 6d.
26. *The Arboreal Flora of Israel and its Ecological and Phytogeographical Significance*, by M. Zohary. 1951. 5s.
27. *A Comparative Study of some of the more Important Mechanical and Physical Properties of Trinidad and Burma Grown Teak (*Tectona grandis* L.)*, by R. Smeathers. 1951. 2s. 6d.
28. *The Grass, Fern, and Savannah Lands of Ceylon, their Nature and Ecological Significance*, by C. H. Holmes. 1951. 20s.
29. *The Vegetation of British Guiana—A Preliminary Review*, by D. B. Fanshawe. 1952. 10s.
30. *Management Records: the Maintenance of Histories of Forest Management Units in the British Commonwealth*, compiled by N. V. Brasnett. 1954. 6s.
31. *The Growth and Mineral Nutrition of Spruce and Pine in Heathland Plantations*, by L. Leyton. 1954. 12s. 6d.
32. *The Form and Taper of Forest-tree Stems*, by H. R. Gray. 1956. 12s. 6d.
33. *Experiments with Hardwoods on Heathland*, by G. W. Dimbleby. 1958. 5s.
34. *The Management of Natural Tropical High Forest with special reference to Uganda*, by H. C. Dawkins. 1958. 25s.
35. *A Study of the Plant Ecology of Busoga District, Uganda Protectorate*, by G. H. S. Wood. 1960. 12s. 6d.

FOREST FLORAS AND CHECK-LISTS

4. *Draft of First Descriptive Check-list for Ceylon*. Compiled by L. A. J. Abeyesundere and R. A. de Rosayro of the Ceylon Forest Department and the staff of the Imperial Forestry Institute. Mimeograph, 1939. 7s. 6d.
5. *Tanganyika Territory, Part I*. Compiled by F. B. Hora of the Imperial Forestry Institute, P. J. Greenway of the Amani Research Station, and others. 1940. 10s.
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7. *Forest Flora of Northern Rhodesia*, by F. White, assisted by A. Angus. Prospectus available. (In press.)

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Notes on the History of Wytham Estate with Special Reference to the Woodlands, by A. J. Grayson and E. W. Jones. 1956. 5s.

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